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Science and Technology Perspectives

Re-Issue

DEVELOPMENTS

Aviation CAD/CAM

(PRC) China has developed a CAD/CAM system for its aircraft industry. Employing some 140 specialists, the Ministry of Aviation Industry developed the system in Xian, where it is used in the manufacture of military and civilian aircraft (such as the Yun-7 transport). Chinese officials note that the system integrates technologies developed in the early 1970s through the early 1980s. (Beijing RENMIN RIBAO 3 Nov 86)

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Government-approved participation in SDI research has drawn a mixed reaction from Japanese firms.

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Super-deep drilling operations have provided evidence of the nonbiogenic formation of oil and gas, a potential source of economically important natural fuel reserves.

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PERSPECTIVES selections are based solely on foreign press, books and journals, or radio and television broadcasts. Some of the source materials used in this publication will appear as abstracts or translations in FBIS serial reports. Comments and queries regarding this publication may be directed to the Managing Editor or to individuals at the numbers listed with items.

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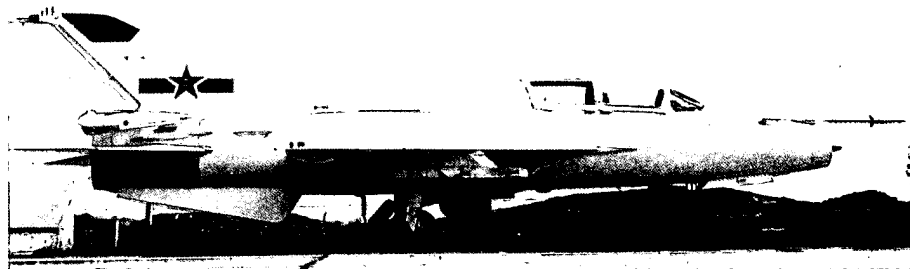
DEVELOPMENTS

*DEVELOPMENTS highlights worldwide S&T events reported in the foreign media. Items followed by an asterisk will be published by FBIS. The contributor's name and telephone number are provided.**

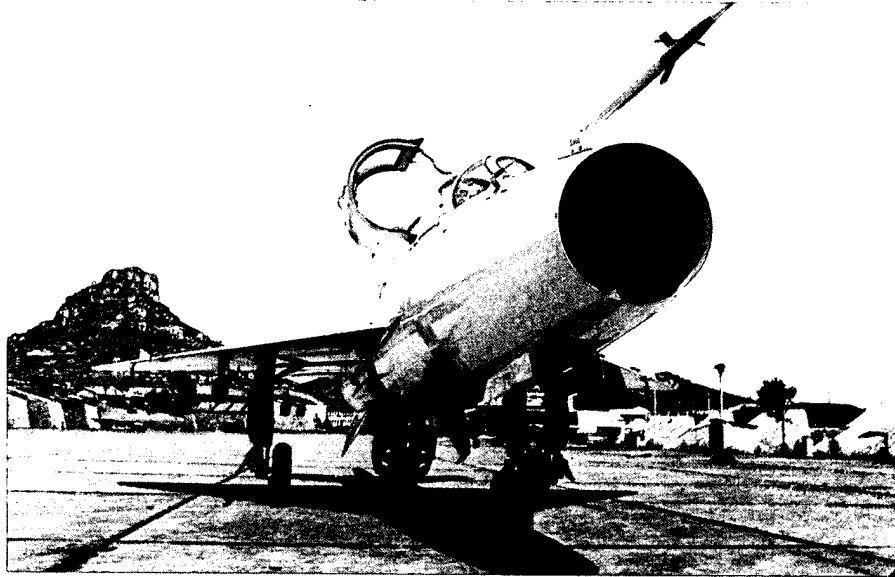
Aircraft

(PRC) The cover of the Beijing journal GUOJI HANGKONG (INTERNATIONAL AVIATION, Oct 86) carries what are believed to be the first photographs released to the public of the Chinese-manufactured FT-7 jet trainer. Described as a "supersonic fighter trainer," the aircraft is derived from the Chinese F-7 (a modified version of the Soviet MiG-21) and closely resembles the Soviet MiG-21U Mongol two-seat trainer. The journal provides no technical information on the aircraft. The aircraft, shown below, bears "August 1" People's Liberation Army Air Force markings. For color negatives and viewgraphs, contact

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The Chinese FT-7 supersonic trainer

FOR OFFICIAL USE ONLY*The Chinese FT-7 supersonic trainer***Ariane**

(France) Additional testing of the redesigned Ariane third-stage igniter will delay the next booster launch by "several weeks" beyond the February 1987 target date, according to Arianespace President Frederic d'Allest. The delay has already cost Arianespace Fr500 million in launch revenues, and further improvements to the third-stage engine will cost about Fr1 billion over the next two years. (Paris AFP—AGRA Data Base 2 Dec 86) [REDACTED]

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Biotechnology

Bonn plans to invest DM1.4 billion between 1987 and 1989 in a national biotechnology program that will focus on corporate genetic engineering research and on the construction of biotechnology R&D centers. In addition, legal restrictions on the industrial production of genetically engineered insulin and interferon will be relaxed, whereas other (unspecified) genetic experimentation will be restricted. (Sutton EUROPEAN CHEMICAL NEWS Sep 86—CURRENT BIOTECHNOLOGY ABSTRACTS Data Base) [REDACTED]

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(CEMA) As part of the 27th session of the Automation Section, CEMA Permanent Commission of Ferrous Metallurgy, a meeting was held on 25 September at the Katowice Metallurgical Plant in Poland on use of information science and computers in management and production control processes. The meeting was attended by metallurgical industry officials and scientists from Bulgaria, Romania, the USSR, Czechoslovakia, Hungary, the GDR, Poland, and Yugoslavia. Participants familiarized themselves with the automated management systems used at the Katowice plant, the control system used in the rolling mill, and the plant's data processing center. (Katowice TRYBUNA ROBOTNICZA 26 Sep 86) [REDACTED]

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(Netherlands/USSR) The USSR is considering three proposals by the Dutch Tulip computer company that would involve either direct supply of Tulip products, production under license, or the establishment of a joint venture in the Soviet Union. Tulip's manager R. Romain says that the Soviets are interested in the entire range of his company's products. The Soviets have also established contacts with the Dutch AKZO and Philips companies. (Amsterdam COMPUTABLE 31 Oct 86) [REDACTED]

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	(UK) The British Alvey program's Analyst Assist software will be evaluated for application by the British Navy in complex real-time systems such as battlefield command support systems. The program, which costs 2 million pounds, uses AI techniques to write complete and flawless software specifications. (Amsterdam COMPUTABLE 31 Oct 86) [redacted]	STAT STAT
	(Netherlands) Twenty scientists from Philips and five Dutch universities have begun a four-year, 25 million guilder fifth-generation computer project called "Prisma" (Parallel Inference and Storage Machine). The project's goal is to develop theories and practical applications for massively parallel computers. (Rijswijk PT AKTUEEL 26 Nov 86) [redacted]	STAT
Crystallography	(PRC) Dr. Li Fanghua of the Chinese Academy of Sciences' Institute of Physics has used electron microscopy to detect changes in crystals. Extending this approach, institute researchers for the first time have been able to create a contrast image of lithium ions in a crystal. (Beijing RENMIN RIBAO 3 Nov 86) [redacted]	STAT
Microelectronics	(FRG/Netherlands) Siemens and Philips plan to jointly develop a 16-megabit DRAM and collaborate in research on advanced semiconductor production technology. In addition, the two firms have established a joint venture called "COSY Microtec," which will market a compact synchrotron for use in X-ray lithography. (Rotterdam NRC HANDELSBLAD 5 Nov 86) [redacted]	STAT
Robotics	(Hungary/USSR) The Tungsram Factory is manufacturing controls for the Soviet Beta robot. Capable of handling up to 60 kilograms, the robot is used mainly for automobile assembly, loading, and spot welding. The control system consists of a computer that runs 16 main programs, 32 sub-programs, and 16 cycle programs. The control system also has programming and diagnostic units that use seven independent programs. Tungsram will soon begin producing a broad-current cabinet for the Beta's motor drive controls. (Budapest NEPSZAVA 12 Nov 86) [redacted]	STAT
Superhard Materials	(USSR/GDR) The Institute for Superhard Materials in Kiev is seeking the participation of GDR firms in the coproduction of superhard materials. The institute produces materials that have a durability comparable to that of diamonds and that display other industrially applicable characteristics such as efficient heat conductivity. Superhard materials have uses in the production of machine tools, microsurgical instruments, and electronic components. (Leipzig LEIPZIGER VOLKSZEITUNG 4-5 Oct 86) [redacted] [redacted]	STAT STAT

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JAPAN: PARTICIPATION IN SDI RESEARCH

Key Points: Japanese defense contractors have expressed their intent to participate in SDI research. However, nondefense companies fear that their technological innovations will fall into the hands of US competitors and doubt that SDI-related technologies have civilian applications, according to Tokyo press reports over the last three months.

The Ministry of Foreign Affairs (MFA) announced on 9 October that individual Japanese companies could participate in SDI research by signing agreements with US defense contractors. The MFA believes that Japanese companies will have more opportunity to participate in SDI research by cooperating with US firms rather than by competing with them. The Japanese Government is trying to facilitate Japanese participation by narrowly interpreting the meaning of "weapons technology" and by defining laser weapons as nonnuclear.

Japanese manufacturers of weapons and defense systems are eager to participate in SDI research and expect that new technologies jointly developed with the US will be transferred to Japan. Mitsubishi Heavy Industries Chairman Kanamori stated that unless Japan participates in SDI, his country will be left behind not only in the area of national security but also in technological development. Electronics firms such as NEC and Fujitsu want to participate in the hope of benefiting from civilian spinoff technologies.

Nevertheless, many companies believe that civilian technologies can be developed more cheaply and efficiently independent of military-oriented research. These companies are also concerned that the US might monopolize the results of Japanese SDI research. This concern has made nondefense firms reluctant to participate in the research. The president of Toshiba expressed his fear that "our technology will just be passed to US competitors" and that the United States will prevent Japan from applying SDI-related technology to civilian uses. The Matsushita Electric Industrial Company has decided to watch SDI research from the sidelines. The firm's managing director observed that "it is hard to apply military technology to civilian uses. In the case of laser technology, for example, I doubt if there is any civilian demand for such a high power laser device as the one used for SDI."



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FOR OFFICIAL USE ONLY**USSR: NONBIOGENIC PETROLEUM FORMATION**

Key Points: As a result of super-deep drilling operations to reach major oil and natural gas deposits, Soviet scientists say they have gathered evidence that supports the theory of nonbiogenic petroleum formation, according to the ZHURNAL VSESOYUZNOGO KHIMICHESKOGO OBSHCHESTVA im. D.I. MENDELEYEVA (Sep-Oct 86). If this century-old theory proves correct, the Soviets have taken the lead in tapping a new source of natural gas and petroleum using technology that could greatly increase domestic production.

Introduced by D.I. Mendeleyev in 1877, the theory of nonbiogenic petroleum formation states that carbon- and hydrogen-containing gases (such as methane) and liquids, which escape from the Earth's magma into fissures deep in the crust, are transformed over millions of years into natural gas and petroleum. Most petroleum obtained from relatively shallow wells was created biogenically through the decay of organic material. However, Soviet deep-drilling over the last 20 years has provided evidence that supports the Mendeleyev theory. (For previous reporting on Soviet deep-drilling technology, see SCIENCE AND TECHNOLOGY PERSPECTIVES Vol. 1, No. 8. pp 4-5.)

In super-deep drilling operations on the Kola Peninsula (at depths of 12,000 meters), in the Dneprosko-Donetskaya Basin (at depths of 4,500 to 6,000 meters), and in several other regions, the Soviets have discovered oil and natural gas in thick layers of igneous rock filled with fissure-like cavities and caverns—formations radically different from the porous, water-saturated sandstone which contains organically produced petroleum.

Nonbiogenic deposits exhibit properties that distinguish them from biogenic occurrences. Nonbiogenic methane has a far higher concentration of Carbon 13 than biogenic methane and nonbiogenic gases have a higher ethane content. The Kola Peninsula borehole yielded large quantities of methane, smaller amounts of ethane, propane, and butane, and traces of pentane, hexane, and black petrolatum-like bitumen. At depths of 6,500 to 10,500 kilometers, natural salt, helium, hydrogen, nitrogen, and hydrocarbons were found, indicating that the petroleum precursors had seeped up from the subcrustal region. Thirty super-deep petroleum sources have been developed in the Dneprosko-Donetskaya Basin. The wells yield 500 tons of petroleum and more than 1 million cubic meters of natural gas per day.

Soviet scientists assert that evidence of nonbiogenic petroleum formation challenges the traditionally held concept that "fossil fuels" are the result of finite processes. Moreover, they project that the discovery of major new nonbiogenic oil and natural gas fields would greatly boost domestic production of natural fuels, perhaps providing a surplus for export.



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FOR OFFICIAL USE ONLY**ISRAEL: FIGHTER PILOT HELMETS**

Key Points: Israel has announced two newly developed technologies for use in fighter pilot helmets. One system, designed by Elop, displays a holographic video image on the helmet's visor. The other system, designed by Elbit, is a "see and destroy" device in which target acquisition is computed based on the angle of the pilot's head at the time of visual contact.

Elop Electro Optics Industries, Ltd. has completed R&D on a new device that displays a holographic video image on the pilot's visor. The image is transmitted by optical fibers linked to the aircraft's computer system. The display affords the pilot a 360 degree view of the combat environment rather than just the area ahead of him (as is the case with a head-up display), according to a September article in the Israeli Air Force journal BITA'ON HEYL HA'AVIR.

The helmet is made of light plastic and weighs 200 grams. The instrumentation does not add significantly to the weight of the avionics system nor does it restrict the aircraft to specific types of weapons.

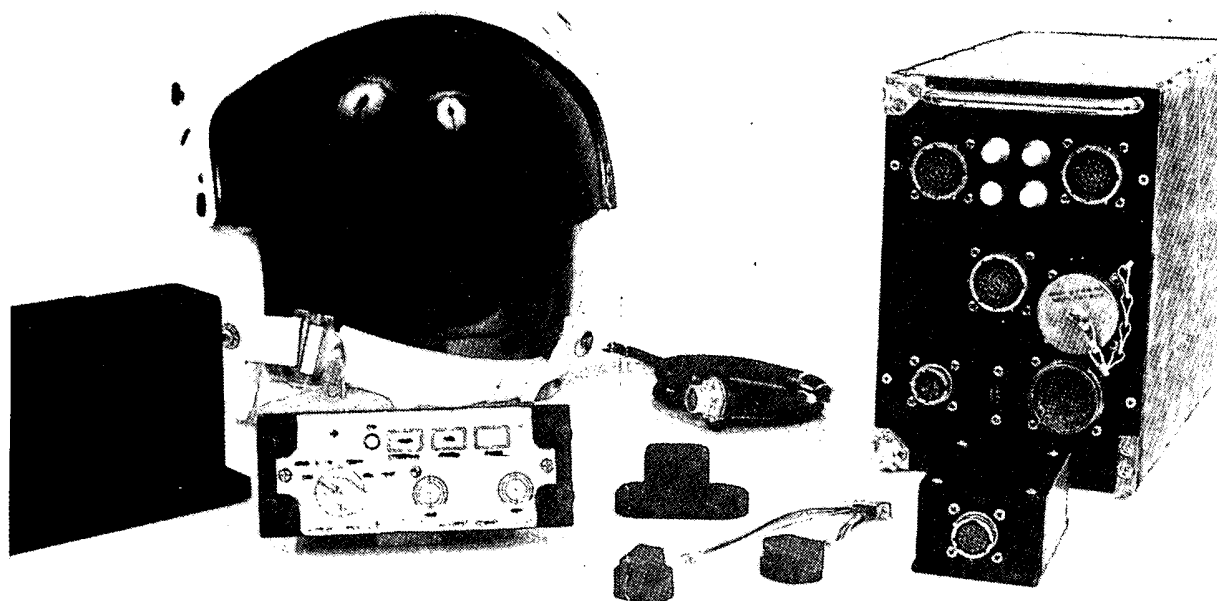


The Elop holographic helmet

Elbit Computers, Ltd. has developed a helmet that employs a computer-aided "see and destroy" system for target acquisition. The helmet uses a computer (located in the canopy) which is tied into the fire control system. A small receiver mounted in the helmet sends the computer data on the directional orientation of the pilot's head at the time of visual contact with the target. The computer processes the data, compensating for the pilot's angle of vision during in-flight maneuvers, and indicates target acquisition by flashing a signal on the helmet's visor. Missiles fired by the aircraft proceed on a straight course for 200 meters before veering off toward the target.

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The receiver weighs only 20 grams and the weight of the helmet is 1.5 kilograms or 13.5 kilograms under a 9g force (an acceptable weight for this equipment).



The Elbit "See and Destroy" helmet



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FOR OFFICIAL USE ONLY**REPORTS**

REPORTS surveys science and technology trends as detailed in articles, books, and journals. It also includes summaries and listings of articles and books which may serve as potential sources for future research. Conference proceedings will occasionally be presented in this section.

POLAND: FIBER OPTICS R&D

Poland has launched an expanded fiber optics R&D effort as part of a drive to modernize its telecommunications system, according to a 24 September report in SZTANDAR LUDU.

The Center for Optical Telecommunications Technology in Lublin began optical fiber prototype testing in 1983 and is currently producing what is described as "first-generation" fiber optic cable capable of transmitting information a distance of 10 kilometers without a boosted signal. The center produced an estimated 1,000 kilometers of optical fiber in 1986 (a slight increase over the previous year) which will be used to manufacture 70 kilometers of cable. The center expects to double its cable production in 1987 and projects a 200-kilometer cable output in 1988. The center's production capacity will top out in 1988 because of outmoded equipment and inadequate floor space.

The Elektroprojekt Planning Enterprise, which designs and builds facilities for Poland's advanced technology industries, will meet the Center's immediate floor space needs by building a new 5,000-cubic-meter production plant. Scheduled for completion in 1987, the facility will be equipped with West European (Austrian or French) production machinery. Plans for further expansion include a 35,000-cubic-meter complex, slated for completion in 1990. The complex will have research and precision measurement departments, repair facilities, and a chemical laboratory. Future plans call for the Center to produce a "second-generation" cable capable of transmitting an unboosted signal 20 kilometers over a completely automated link. (The report notes that the Fiber Optics Technology Laboratory of Copernicus University has experimented with fiber optic cable that can simultaneously carry several thousand calls over a 30 kilometer distance without a boosted signal.) Although the report does not provide specific figures, the Center projects a 25 percent increase in production and a quadrupling of its staff.

Fiber optic cable is currently used in the Lublin, Lodz, and Poznan telephone systems as well as in television broadcasting. It is also used to transmit railroad signals, transfer banking information, and detect earth tremors. The Copernicus University Chemical Institute in Torun has established an experimental computer network linked by fiber optic cable.

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USSR: NEW PUBLICATIONS

NUCLEAR POWER PLANTS

The monograph "Theory and Methods for Adaptive Control in Atomic Power Installations" (Teoriya i metody adaptatsii atomnykh energeticheskikh ustanovok) by V.A. Yeremenko discusses problems and methods relating to the optimal use of nuclear power facilities. These issues are examined in relation to the Soviet capacity for implementing adaptive control and automation processes at nuclear power plants. The monograph also assesses the standard component functions of modern automated systems, methods of applying these systems to power production, and approaches to designing fundamental operating parameters. The structural-metric optimization method for power installations is also discussed. Issues in adaptive theory pertaining to nuclear power facilities are presented and general analytic methods for solving basic adaptive control problems are recommended.

The monograph is intended for researchers, designers, engineers, and technicians at nuclear plants, scientific institutes, and design bureaus as well as for instructors and students at advanced academic institutions.

A translation of the annotation, table of contents, and foreword will appear in USSR REPORT: ENGINEERING AND EQUIPMENT.



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COMMUNICATIONS TECHNOLOGY AND POLICY

The book "RF Spectrum Utilization and Radio Interference" (Ispolzovaniye radiochastotnogo spektra i radiopomekhi) by Ye. I. Yegorov presents organizational, legal, and technical fundamentals governing the use of radio frequencies and gives technical characteristics and parameters of certain antennas, transmitters, and receivers (with emphasis on selectivity). It analyzes the nature of interference signals and methods for their reduction.

The book is intended for engineers and technical personnel involved in the development, operation, and maintenance of radio equipment.

A translation of the foreword, table of contents, introduction, and annotation will appear in USSR REPORT: ELECTRONICS AND ELECTRICAL EQUIPMENT.



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FOR OFFICIAL USE ONLY**JAPAN: HOT ISOSTATIC PRESSING**

Hot isostatic pressing (HIP) equipment generating pressures of 5,000 and 10,000 atmospheres has been developed by Mitsubishi Heavy Industries in cooperation with the Science and Technology Agency's National Institute for Research in Inorganic Materials. Used in the formation of composite materials, HIP equipment had been limited to the 2,000-atmosphere range, according to a 21 October report in NIHON KOGYO SHIMBUN.

Compressor and pipe fittings limit the current capability of HIP devices. The new equipment, however, has been equipped with an irreversible valve through which argon is injected into a piston-cylinder apparatus, creating a high-pressure chamber. Chamber pressure is initially raised to 2,000 atmospheres and then elevated to 10,000 atmospheres by increasing the force on the piston.

A HIP device capable of generating 5,000 atmospheres (1,200°C) of pressure will be delivered to the Geological Survey of Japan by the end of the year. A 5,000-atmosphere pressure is equivalent to that produced at a depth of 15,000 meters. The Geological Survey of Japan plans to research the synthesis of various minerals by reproducing the high temperatures and pressures found deep within the Earth.

A second machine capable of generating 10,000 atmospheres of pressure will be manufactured for the National Institute for Research in Inorganic Materials. The institute plans to use the machine to produce distortion-free composite materials. Because the heat expansion rates vary for different materials, current isostatic pressing methods create distortions in the area of the bond, thereby decreasing the strength of the new material. Institute scientists believe that the formation of distortion-free materials is feasible provided the heat-expanded area is "shrunk back" by pressure. For example, a temperature increase of 71°C in iron causes it to expand .001 times its original size. Pressure equivalent to 7,100 atmospheres is required to contain this expansion.

Mitsubishi Heavy Industries plans to showcase this latest advance in hot isostatic pressing technology as part of a more aggressive sales campaign. Japan is second only to the United States in the use of HIP equipment. Of the more than 100 devices in Japan, 90 percent are operated by Kobe Steel.



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JAPAN: BIOCOMPATIBLE MATERIALS

The Agency of Industrial Science and Technology's Mechanical Engineering Laboratory, Government Industrial Research Institute, and Research Institute for Polymer and Textiles will collaborate with Mitsubishi Mining & Cement, Nihon Tokushu Togyo, and Kyocera in an R&D project called the "High Performance Medical Materials and Biocompatible Materials Assessment," according to a 21 October report in NIKKEI SANGYO SHIMBUN.

The five-year project is designed as a comprehensive approach to integrate research in the fields of clinical medicine and biocompatible materials such as new ceramic compounds used in artificial organs and prosthetic devices. Project participants will establish standards for the medical evaluation of biomaterials as well as for the engineering of products that use these new materials.

Specific project responsibilities have been allocated as follows:

- Biomaterials research and equipment design will be handled by the Industrial Research Institute and the Mechanical Engineering Laboratory.
- Physical properties evaluation will be done by the Mechanical Engineering Laboratory.
- Cell, tissue culture, and animal experiment evaluation will be conducted by the Research Institute for Polymer and Textiles and the Mechanical Engineering Laboratory.
- Phosphoric acid-based ceramic biomaterials R&D will be conducted by Mitsubishi Mining & Cement.
- Zirconia-based ceramic biomaterials R&D will be the responsibility of the Nihon Tokushu Togyo Company.
- Aluminum-based ceramic biomaterials R&D will be handled by Kyocera.

Overall funding for the project is set at 240 million yen with combined government and private company allocations amounting to some 98 million yen for FY86.



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PREVIEWS

PREVIEWS is an annotated list of selected science and technology items being translated by FBIS. The list may also contain previously published items of wide consumer interest.

EUROPE/LATIN AMERICA REPORT: SCIENCE AND TECHNOLOGY

EC GUIDELINES FOR 1987-91 TECHNOLOGY R&D PROGRAM

This official European Community document examines planned EC R&D programs and funding over the next five years and defines the "Single Act." It also outlines a new law affecting EC scientific and technical strategy. (Brussels GUIDELINES FOR A NEW COMMUNITY FRAMEWORK PROGRAMME OF TECHNOLOGICAL RESEARCH AND DEVELOPMENT 1987-1991, 17 Mar 86)

ESA AUTHORIZES HERMES PHASE B DEFINITION STUDIES

At a meeting on 22-23 October the ESA decided to adopt a preliminary program aimed at pursuing definition studies of the Hermes spaceplane. Member countries had until 30 November to decide whether or not to participate. The article outlines ESA funding figures for the studies. (Paris AIR & COSMOS 1 Nov 86)

NEW A-320 CHARACTERISTICS, PERFORMANCE FIGURES RELEASED

Article examines new features such as maximum takeoff weights for the A 320-100 and the A 320-200; the addition of wingtip fences; composite material floor panels; and a head-up display on Air Inter versions. (Paris AIR & COSMOS 25 Oct 86)

ACTIVITIES OF THOMSON MILITARY, SPACE DIVISION OUTLINED

Since 1985, Thomson Semiconducteurs has grouped all of its military components activities in a single division, the Military and Space Division (DMS). The article is an overview of this division, its marketing strategy, the technologies it employs, and its product line including ASICs and radiation-hardened components. (Paris AIR & COSMOS 15 Nov 86)

HIGH-LEVEL FRENCH S&T GROUP ANALYZES 1987 R&D BUDGET

A French High Council for Research and Technology (CSRT) report analyzes the national R&D budget for 1987. The report compares the budget to those of previous years and examines R&D strategy, industrial research, and staffing. (Paris AFP SCIENCES 6 Oct 86)

FRENCH ARTIFICIAL INTELLIGENCE RESEARCH PROGRAM

Twenty research teams from 16 of France's most advanced scientific laboratories are involved in the two-year "Program for Cooperative Research in Artificial Intelligence," started in 1985 with an annual budget of Fr38 million. Articles list research topics, laboratories and scientists involved, and describe the program's internal operation and the industrial applications of the research. (Paris ZERO UN INFORMATIQUE 17 Nov 86)

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